

THE EFFECT OF AN AFTER SCHOOL INTERVENTION PROGRAM ON SELECTED HEALTH-RELATED PHYSICAL FITNESS COMPONENTS AMONG SECONDARY SCHOOL BOYS

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Abstract

The aim of the study was to investigate the effect of an after school intervention program on selected health-related physical fitness components among Malaysian secondary school boys. A quasi experimental design was adopted for the study. A school in a district was randomly selected. In the school, two classes were randomly assigned intact to the experimental group (n=25) and the other was the control group (n=25). Pretest data was collected on cardiovascular endurance, flexibility and muscular strength. The experimental and the control groups underwent 80 minutes' regular physical education classes once a week for ten weeks. Apart from the regular physical education classes, the experimental group underwent the intervention program in the form of football training after the school session once a week. After ten weeks, posttest data was collected. ANCOVA indicated that there was a main effect in cardiovascular endurance $F(1,47) = 62.52, p < .05$ and flexibility $F(1,47) = 14.18, p < .05$. As for muscular strength, the result was not significant $F(1,47) = 2.41, p > .05$ for the right hand and $F(1,47) = 1.63, p > .05$ for the left hand. The results indicated that an after school intervention program in the form of football training was effective in enhancing cardiovascular endurance and flexibility among Malaysian secondary school boys.

Key words: health-related fitness, cardiovascular endurance, muscular strength, flexibility, intervention

Introduction

Physical fitness levels in children and adolescents have long been a topic of interest to physical educators as the physical fitness level among children and adolescents remains unacceptably low. World Health Organization's report (WHO, 2010) indicated that more than 40% of the children under the age of 5 were overweight worldwide. Prior to that, Centers for Disease Control and Prevention [CDC], 2005, indicated that the percentage of young people who are overweight has almost doubled and approximately 9 million young people are considered overweight. Physical inactivity has been identified as a serious cause and major public health concern for people of all ages (USDHHS, 2008). The sedentary behavior established among children in the developed world (Gordon-Larsen, Nelson & Popkin, 2004) and the rise of similar patterns at developing countries are said to be the contributing factor to the worldwide obesity epidemic (Raymond, Leeder & Greenberg, 2006). In fact, the low fitness level among children irrespective of their gender and geographical distribution, have exposed them to various health problems in the form of diseases too (Flegal, Carroll, Ogden & Curtin, 2010).

In Malaysia, health risk detected by self-monitoring at health clinics had indicated 18% and 25.2% of the individuals were overweight in 2009 and 2010 respectively whereas people who are being obese has increased from 9.3% in 2009 to 10% in 2010 (Ministry of Health, 2010, pg.90). Dan, Mohd Nasir and Zalilah (2011) reported that one third of the respondents between the ages 13-14 years in a survey were in the low physical activity level category. Wilson's (2008) Pilot Study Report for Survey of Physical Activity and Sport among Malaysian Children also showed Malaysian children's preference for sedentary pursuits, rather than sport or active games in their leisure time.

In view of this problem and to modify the above situation, all school going children should be encouraged and motivated by the teachers to participate in physical activity (PA) through physical education (PE) programs of high quality conducted in schools to educate and enhance health-related fitness components (Levin et.al., 2001; USDHHS 1996, 2001, 2008). Longitudinal data have shown that the participation of normal weight adolescents in physical education (PE) on each weekday has decreased the odds of becoming overweight in adulthood by 5% (Menschik, Ahmad, Alexander & Blum, 2008). Thus, the school based physical

education programs that are effective would have the potential to increase PA levels and the knowledge of fitness and therefore play an important role in promoting health-related fitness components and in contributing to public health (Wallhead & Buckworth, 2004).

PE lessons in Malaysia are practiced either as a one session of 80 minutes' lesson in a week or as two sessions of 40 minutes PE lessons in a week. Both practices are insufficient for the students to attain the minimal requirements set by the American College and Sports Medicine (ACSM) guidelines. The ACSM recommends that an individual should engage in moderate to vigorous cardiorespiratory exercise training for 20 to 30 minutes a day for 3 to 5 days a week or for a total of 150 minutes a week to achieve a total energy expenditure of 500-1000 MET minutes a week (ACSM, 2011).

As physical education programs provide up to only 8%–11% of a student's daily physical activity (Tudor-Locke et al., 2006), proper intervention programs with sufficient intensity levels were recommended to be implemented at the school level (Council for Physical Education [COPEC] 1998; Dan, Mohd Nasir & Zalilah, 2011). Various intervention programs were used within a PE lesson to determine their impact on the physical fitness level in general; weight training (Faigenbaum & Pollock, 1999), aerobic activities (Fisher et al., 2011), circuit training (Rengasamy, 2012), basketball (Wallhead & Ntoumanis, 2004), jumping activity (Weeks, Young & Beck, 2008) and a variety of ball games (Stenevi-Lundgren, Daly & Karsson, 2010).

Although physical activity interventions within a PE lesson hold great potential and remain important in increasing physical fitness level of children and adolescents, increasing the frequency and duration of PE is not always feasible given competing curriculum demands. Thus, after-school physical activity programs are emerging as potentially useful and feasible locations for physical fitness enhancement. Among the programs used are; combination of strength and plyometric training (Ronnestad, Kvamme, Sunde & Raastad, 2008), basic mat routine exercise (Kloube, 2010), strength training exercises (Faigenbaum, Milliken, Loud & Burak, 2002), aerobic activity in the form of sports, games and dance (Vizcaino, Aguilar & Gutierrez, 2008), a combination of homework and soccer (Weintroub et al., 2008) and dance program (Jago, Page & Cooper, 2012).

The effectiveness of such programs in increasing the physical fitness levels of participants is still being evaluated as not all the intervention programs had produced significant impact on health related physical fitness components due to some limitations in the form of sample size, gender, type of intervention program used, duration and frequency of the programs. Thus, studies with different types of programs, especially game based, to enhance children's physical fitness are needed. Besides that, there is a need to study and determine the impact of after school intervention programs on students' health related physical fitness components in Malaysia as local research has indicated low health-related fitness level among students (Balakrishnan, 2003; Rengasamy, 2008, 2012). The lack of published researches on the use of game based after school intervention programs in enhancing health related fitness components locally has prompted the current study. The purpose of this study was to investigate the effect of an after school football intervention program in enhancing the students' selected health related physical fitness components.

Methodology

A secondary school in the district of Petaling Jaya, in the state of Selangor was randomly selected for the study. There were a total of seven form four classes in the selected school. Two form four classes in the school were randomly selected and randomly assigned intact for the study. One group was assigned as the control group and the other group was assigned as experimental group. The control group ($n=25$) and experimental group 2 ($n=25$) consisted of the same number of boys respectively and their mean age was 16.4; SD 0.42. The PE lesson in the selected school was practiced for one session of 80 minutes per week. During the study period, the number of students remained the same as none of the students neither from the control group nor the experimental group opted out of the study.

Design and Procedure

A quasi-experimental design with a pretest-posttest design was adopted for the study (Gay, 1992). The control group and the experimental group followed their regular physical education conducted for 80 minutes once a week. However, the experimental group underwent an

additional after school activity in the form of 45 minutes' football intervention program weekly.

Physical Education Life Cycle

Physical education lesson is divided into sections and each section plays an important role in achieving the daily objective of the lesson (Rink, 1993). In the present study, the lesson started off with the general warm up that consisted of ten different types of exercises including light jogging and stretching exercises. It was followed by the activity section where the teacher introduced and demonstrated the skill that was to be learned for the day. In the present study, both the control group and experimental group were introduced to football skills during the first five weeks and it was followed by the introduction of athletics skills during the following five weeks to accommodate the ten weeks period in accordance to the Malaysian PE syllabus. The activity session was followed by the group activity session to enhance the skill acquisition. Then a modified mini game session followed during which the students played and applied the day's skill in an actual game like situation. Every student was involved in the mini game session that had competitive nature with fun incorporated in it. Finally, it was followed by the cooling down session.

In order to remove teacher effect, the selected classes were taught by qualified PE teachers with a minimum of five years of teaching experience in teaching PE. The teachers were briefed on the module prepared by the researcher. The module described what types of exercises were to be given during the warm-up session and the types of drills to be followed during the teaching unit for both the control group and the experimental group. The prepared module was to be followed strictly by the teachers to avoid the teacher effect or any other variance. The translated form of the Form Four Malaysian PE syllabus was taught to both the control and experimental groups of boys in the selected school. By doing so, both the groups received similar warm-up exercises, type of drills, group activity, mini games and the cooling down exercises.

Treatment

In the present study which was conducted for ten weeks, a 45 minutes' after school football intervention program (**Diagram 1, page 18**) was utilized to investigate its effect in enhancing the students' physical fitness in the selected health-related physical fitness components. Only the experimental group underwent the after school intervention program on Tuesdays for 10 weeks. Once the group had assembled after the school hour, the intervention program began at four o'clock and lasted for forty-five minutes. The program began with the warm-up session involving jogging and stretching exercises for about ten minutes to elevate the heart rate gradually to 122 beats (60%) and above per minute, similar to Rengasamy, (2006). It was followed by some basic skill enhancing drills consisting of heading, throwing, dribbling and goalkeeping skills for 8 minutes during every session. After that, the subjects were introduced to a particular football skill on every session until the tenth week for 12 minutes. Then, all the subjects were grouped together to get involved in a mini football session for 10 minutes. The heart beat rate was maintained at 122 beats or increased further over a continuous period during the sessions before gradually bringing it down during the cooling down session that lasted for 3 to 5 minutes. After ten weeks, post-test was conducted and data was collected and analyzed for between group differences using ANCOVA.

Testing

A common pretest was given using Cooper Test for cardiovascular endurance with a reliability .90 for men (Burke, 1976) and the validity coefficients of .92 (Grant et al., 1995) and it possesses a high correlation with VO_{2max} of $r = .90$ (Cooper, 1968) as well as (Baumgartner & Jackson, 1992) and (Castagna, Abt, D'Ottavio and Weston, 2005). The Test was conducted on a 400 meter track in the school field as recommended by Baumgartner and Jackson (1991).

Flexibility was assessed using the Sit and Reach Test using a specially constructed box with a reliability of 0.89 to 0.97 (Safrit & Wood, 1987) and the validity coefficients of .64 (Jackson & Langford, 1989). This protocol was supported in studies by Faigenbaum et al. (2002), Hatano et al., (1997) and Singh (2005).

The measurement of the hand strength was carried out by a hand dynamometer as seen in a study by Faigenbaum et al. (2002). The reliability reported is .90 (Baumgartner & Jackson,

1991). The hand dynamometer was adjusted before the test to check the suitability of the grip to ascertain the right grip size by adjusting the grip lever.

Results

ANCOVA was utilized in the present study which has employed a quasi-experimental design with intact sampling method. Data were analyzed for normality using the test for skewness and kurtosis. The data indicated that the groups were approximately distributed. Further, linearity and regression slopes assumption for ANCOVA were met. For the statistical analysis, the level of confidence was set at .05. To ascertain the effect of the treatment between the experimental and the control group, ANCOVA was computed using the posttest score as the dependent score and the pretest score as the covariate whereas the groups were the fixed factor. Effect size was calculated for each comparison using Cohen's delta to evaluate the size of mean differences.

Table 1

Mean, Standard Deviation and Adjusted Posttest Mean Scores for the Health-Related Physical Fitness Components of the Groups

		Experimental Group (n:25)			Control Group (n:25)		
Health Related Components		Pre	Post	Adjusted Mean	Pre	Post	Adjusted Mean
Cardiovascular Endurance	Mean	1635.00	1701.60	1587.85	1409.00	1416.00	1529.75
	SD	335.26	340.88		205.63	204.11	
Flexibility	Mean	29.64	30.58	32.14	32.85	33.22	31.66
	SD	6.54	6.28		5.63	5.62	
Muscle Strength Right Hand	Mean	33.72	33.93	33.82	33.51	33.58	33.69
	SD	4.79	4.84		3.76	3.77	
Muscle Strength Left Hand	Mean	31.58	31.80	31.84	31.65	31.79	31.75
	SD	3.85	3.72		4.14	4.26	

The analysis of data in Table 1 showed the pretest and posttest mean, standard deviation and adjusted posttest mean scores of the selected health-related fitness components for the experimental and the control groups respectively. The analysis indicated that the pre-test mean score and standard deviation for the experimental group were ($M=1635.00$, $SD=335.26$) for the component of cardiovascular endurance, ($M=29.64$, $SD=6.54$) for the component of flexibility, ($M=33.72$, $SD=4.79$) for the component of muscular strength of the right hand and ($M=31.58$, $SD=3.85$) for the component of muscular strength of the left hand. After undergoing the 10 weeks intervention program, the experimental group's post-test mean score and standard deviation increased to ($M=1701.60$, $SD=340.88$) for the component of cardiovascular endurance, ($M=30.58$, $SD=6.28$) for the component of flexibility, ($M=33.93$, $SD=4.84$) for the component of muscular strength of the right hand and ($M=31.80$, $SD=3.72$) for the component of muscular strength of the left hand. The mean was adjusted to 1587.85 for cardiovascular endurance, 32.14 for flexibility, 33.82 for the muscular endurance of the right hand and 31.84 for the muscular endurance of the left hand.

On the other hand, the pre-test mean score and standard deviation for the control group were ($M=1409.00$, $SD=205.63$) for the component of cardiovascular endurance, ($M=32.85$, $SD=5.63$) for the component of flexibility, ($M=33.51$, $SD=3.76$) for the component of muscular strength of the right hand and ($M=31.65$, $SD=4.14$) for the component of muscular strength of the left hand. After undergoing the 10 weeks of regular Physical Education program without any intervention, the control group's post-test mean score and standard deviation were increased to ($M=1416.00$, $SD=204.11$) for the component of cardiovascular endurance, ($M=33.22$, $SD=5.62$) for the component of flexibility, ($M=33.58$, $SD=3.77$) for the component of muscular strength of the right hand and ($M=31.79$, $SD=4.26$) for the component of muscular strength of the left hand. The mean was adjusted to 1529.75 for cardiovascular endurance, 31.66 for flexibility, 33.69 for the muscular endurance of the right hand and 31.75 for the muscular endurance of the left hand.

Table 2*Summary of ANCOVA for the Selected Health-Related Physical Fitness Components*

Source	SS	df	MS	F	ES
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Cardiovascular Endurance					
Between	36011.92	1	36011.92	62.52*	.57
Error	27073.98	47	576.04		
Total	126301100.00	50			
Flexibility					
Between	2.75	1	2.75	14.18*	.23
Error	9.11	47	.19		
Total	52673.00	50			
Muscle Strength (Right Hand)					
Between	.24	1	.24	2.41	.05
Error	4.58	47	.10		
Total	57873.96	50			
Muscle Strength (Left Hand)					
Between	.09	1	.09	1.43	.03
Error	2.90	47	.62		
Total	51318.02	50			

* $p < .05$

The result of ANCOVA in Table 2 indicated that there was a significant main effect for the component of cardiovascular endurance with $F(1, 47) = 62.52, p < .05$; $Cohen\ d = .57$; and the component of flexibility recorded $F(1, 47) = 14.18, p < .05$; $Cohen\ d = .23$. As for the other selected health related physical fitness component in this study, significant effect was not observed.; muscular strength of the right hand indicated $F(1, 47) = 2.41, p > .05$; $Cohen\ d = .05$

and the muscular strength of left hand was at $F(1, 47) = 1.63, p > .05$; $Cohen\ d = .03$. The result showed that the treatment in the experimental group was only effective in enhancing the cardiovascular endurance and flexibility among the subjects in the experimental group.

The present study was aimed at investigating the effect of an after school intervention program in the form of football training in enhancing the selected health-related physical fitness components of the secondary school boys in a selected school in Malaysia. The results indicated that statistically there was a significant difference ($p < 0.05$) towards the components of cardiovascular endurance and flexibility between the groups when posttest scores were compared (Table 2). As for the components of muscular strength the difference was not significant ($p > 0.05$).

The significant differences obtained in the component of cardiovascular endurance in the present study was in agreement with similar studies reported by Dragevick et al., 1987; Derri, Aggeloussis and Petraki, 2004; Hamlin, 2002; Ignico and Mahon, 1995; Sallis et al., 1997 and Singh, 2005. These studies showed significant improvement in the performance of the experimental group when compared with the control group for the component of cardiovascular endurance.

In the present study, in addition to the weekly PE classes of 80 minutes, the experimental group underwent a 45 minutes' football intervention program that was carried out after the school hours. As an aerobic energy based game, the game of football was played for 45 minutes and the duration was sufficient for the minimal requirement suggested by ACSM (2011) which indicated that to have a measurable training effect, individuals must participate at least 2-3 days in a week, in 20-60 minutes of continuous or intermittent activities at 50 to 60 percent of the maximum heart rate. In addition, the subjects in the experimental group did a lot of running activities at different pace throughout the intermittent football sessions. Thus, the intensity level and the training volume increased gradually during the 10 weeks.

As stressed by GAS theory, the stress applied through the gradual process during the football program was within their tolerable limits. Thus, this would have probably enabled the subjects to undergo adaptation process progressively over the 10 weeks period and this could have enabled the subjects to acquire substantial amount of physical activity which improved their aerobic capacity. So, physiological adaptation had taken place and the subjects'

cardiovascular endurance was enhanced to meet the demands placed on them during the football game. As physiological adaptation would improve the endurance in general (ACSM, 1998 & 2011; Corbin, 1987; Cureton, 1987; & Sallis, 1987, and Shepard, 1999), it had enabled the subjects from the experimental group to attain a significant result for the component of cardiovascular endurance in this study. Similar to Hamlin, Ross and Sang (2002) and Werner & Durham (1998) who obtained the significant outcome with the use of additional 20 minutes and 15 minutes sessions respectively in addition to the regular PE session, the additional 45 minutes' after school football program introduced for the experimental group could be the major reason for the significant outcome, as it showed consistent outcome with the previous studies mentioned above.

As for flexibility, the result indicated a statistically significant difference ($p < 0.05$) between the experimental and control group (Table 2). Similar studies implementing intervention programs have reported significant improvements in flexibility level of the subjects as the training was carried out two to three times per week. (Derri et al., 2004; Ignico & Mahon, 1995; Faigenbaum & Mediate, 2006; Jackson, Morrow, Hill and Dishman, 1999; Pate, Slentz and Katz, 1989 and Jackson & Langford, 1989)

The increase in the training volume and the frequency of the training could be associated with the significant result obtained in the present study. The experimental group underwent warming up and cooling down exercises regularly during the PE session once a week and in addition to that they also underwent the warming up and cooling down sessions during the after school football intervention session. As there was an increase in the volume and frequency of stretching exercises per week, it could indirectly enhanced the subjects' flexibility.

Moreover, as the 45 minutes' football intervention program involved moderate and vigorous activities, the stretching and warming up activities during the warm up and cooling down sessions specifically focused on the core muscle groups of the hamstring and abdominal section. As such, opportunity was created to stress and stretch these muscle groups. Hence, the intervention program used could be a contributing factor to the enhancement of the flexibility level among the subjects of the experimental group in the present study and to the

consistency in the outcome of the present study in comparison with the findings of previous studies by Derri et al., (2004) and Faigenbaum and Mediate (2006).

The findings of the study also indicated that the comparison between the experiment and control groups for the component of muscular strength was not significant for both left and right hands (Table 2). The result is consistent with a similar finding by Faigenbaum et al. (2002) who used unspecified weight training exercises which did not support the overload process in his study. In the present study, the experimental group was exposed to structured physical activity during the PE lesson once a week and also during the 45 minutes' after school football intervention program held once a week, for ten weeks. As the football training focused more on abdominal and lower body strength, it was not able to produce much impact on the hand strength of the subjects. In addition, the exercises in the warm-up, skill enhancement, skill acquisition and mini game session were carried out by the subjects using their own body weights. Thus, the specific muscle groups in the upper body did not receive the required intensity or the sufficient overload needed to enhance muscular strength as suggested by American Academy of Pediatrics, 2001; Fleck & Kraemer, 1997; and the National Strength and Conditioning Association [NSCA] 1985.

The importance of weight training and overload principle in enhancing muscular strength was further proven by Flanagan et al., 2002. In his study, the experimental group which underwent a specific weight training program received sufficient intensity based on overload principle to produce a significant improvement compared to the control group. Furthermore, Faigenbaum and Mediate (2006) also indicated that a 15 minutes' weight training activity with a medicine ball within a physical education class could produce significant improvements in muscular strength.

Conclusion

The aim of this study was to investigate the effect of an after school intervention program in the form of football training in enhancing the selected health-related physical fitness components among secondary school boys in a selected school in Malaysia. It indicated that the after school intervention program had a positive effect towards the components of cardiovascular endurance and flexibility. As curriculum demands have restricted the increase of

frequency and duration of PE in Malaysia, after-school game based physical activity programs should be the ideal choice for physical fitness enhancement. Physical educators and curriculum planners should introduce after school intervention programs as it is seen necessary for increasing the intensity level which is sufficient to improve selected health-related fitness components among the subjects. If the intervention programs are well planned with the incorporation of training principles based on GAS theory to increase the workload progressively, it would be the best blend for training effect.

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Diagram 1

10 Weeks' Football Intervention Program

Warming Up	Basic Skill Enhancing Drills	Skill Acquisition	Mini Game	Cooling Down
10 minutes	8 minutes	12 minutes	10 minutes	3-5 minutes
Activities:				
Week 1-10 1.Shoulder Rolls 2.Head Tilt 3.Side Stretch 4.Knee Raise 5.Quadriceps Stretch 6.Seated Toe Touch 7.High Knee Jog 8.Star Jump	Week 1-10 1. Heading 2. Throwing 3. Dribbling 4. Goalkeeping	Week 1 & 2 -Passing Week 3 & 4 -Dribbling Week 5 & 6 - Heading &Throwing Week 7 - Goalkeeping Week 8 & 9 - Crossing Week 10 - Shooting	Week 1 & 2 -Passing Week 3 & 4 -Dribbling Week 5 & 6 - Heading &Throwing Week 7 - Goalkeeping Week 8 & 9 - Crossing Week 10 - Shooting *Emphasis on the skill acquired.	Week 1-10 1. Front Thigh Stretch 2. Lateral Bending 3. Side Reach 4. Groin Stretch 5.Trunk Stretch and Drop